



Title: Computer graphics

Final exam, Date: /6/2014, Total marks: 75

Course code: CCE2211

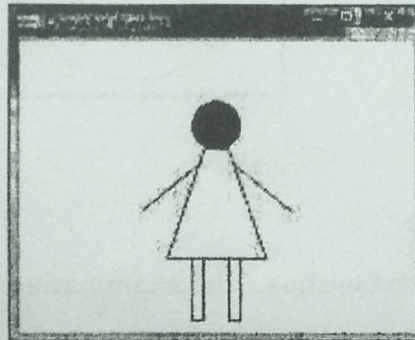
Allowed time: 3 hours

Year: Second year

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## Workout the following questions

- 1) a) We can generally classify graphics utilities and libraries in two main types: the first is two dimensional drawing utilities / libraries and the second is three dimensions utilities / libraries that utilizing scene/viewer/projection model. Explain the main differences between the two types in stressing the role of the graphics creator when using each of them. (5 Marks)
- b) Movies are generally produced on 35-mm film that has a resolution of approximately 2000 x 3000 pixels. What implication does this resolution have for producing animated images for a video show on a computer as compared with film? (5 Marks)
- 2) a) Write a C++ program that draws the following symbolic character using OpenGL library (10 Marks)



- b) OpenGL output is strictly specified and will predictable when we model our objects using *simple, convex and flat* polygons. What is a flat polygon? What is a simple polygon? What is a convex polygon? Give example in drawing when possible (5 Marks)
- 3) a) In OpenGL, we can associate a color with each vertex. If the endpoints of a line segment have different colors assigned to them, OpenGL will interpolate between the colors as it renders the line segment. It will do the same for polygons. Use this property to display the Maxwell triangle: an equilateral triangle whose vertices are red, green, and blue. Explain using code. (7 Marks)
- b) Write an OpenGL program to draw a damped cosine functions four times, each in a separate quarter in the output graphics window. Hint; use the viewport setting to change the location and size of the output graphics area with respect to the output graphics window (8 Marks)
- 4) a) What is the purpose of each of the following OpenGL function calls? Explain how the parameters are used, if any. (8 Marks)
- i) `glClear(GL_COLOR_BUFFER_BIT);`
  - ii) `glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB | GLUT_DEPTH);`
  - iii) `glEnable(GL_DEPTH_TEST);`
  - iv) `glOrtho(-50.0, 50.0, -50.0, 50.0, -50.0, 50.0);`
- b) The manner by which input devices provide input to an application program can be described in terms of two entities: a measure process and a device trigger. (7 Marks)
- i) Explain what is the measure process and what the trigger may be
  - ii) What are the three distinct modes by which an application can get a measured value from an input device





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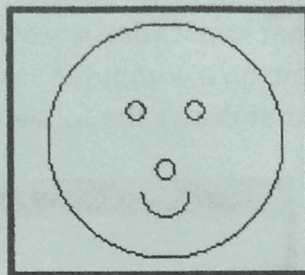
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- 5) a) What is hierarchical modeling? What are its advantages? Give some examples. (5 Marks)
- b) Write an OpenGL program that draw a face. Model the face simply by one circle for the outline, two circles for the two eyes, one circle for the nose, and one half-circle for the mouse (see the figure below). Your program should use hierarchical modeling implemented by display lists to draw the face.



Best wishes... the examination committee